A DOVER COMPANY

Automation

Robohand FERGUSON

CAMCO

SERVICE MANUAL - CONVEYORS
TABLE TOP SERIES
1.5, 2.0, 3.0, 4.5, 6.0 LINK

HEAVY DUTY SERIES
6.0, 9.0 LINK

WARNING

This is a controlled document. It is your responsibility to deliver this information to the end user of the CAMCO or FERGUSON product. Failure to deliver this could result in your liability for injury to the user or damage to the machine. For copies of this manual, call your Customer Service Representative at 800-645-5207

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INTRODUCTION

This service manual pertains to the disassembly and assembly of CAMCO's 1.5 link, 2.0 link, 3.0 link, 4.5 link, and 6.0 link "Table Top" Precision Link Conveyors and CAMCO's 6.0 and 9.0 "Heavy-Duty" Precision Link Conveyors.

The CAMCO Precision Link Conveyor comes in two types: "over and under" and "carousel". Both are driven by a CAMCO Index Drive containing cam followers and a precision ground cam. Inspection and service on the Index Drives is covered in a separate Service Manual for the specific model Index Drive.

This manual is to be used in conjunction with the "General Service Manual" which describes the lubrication and general maintenance of CAMCO Index Drives.

Drawings of the various size links are included in this manual. The procedures in this manual reference the item numbers of these drawings.

Also included is a complete Bill of Materials for your convenience in identifying and ordering spare or replacement parts.

Some users of CAMCO's Precision Link Conveyors have the facilities and trained personnel to accomplish service repair. You must determine the extent to which intricate servicing should be done in your facility. When in doubt, CAMCO recommends that CAMCO trained serviceman make the repairs.

GENERAL DESCRIPTION

The CAMCO Precision Link Conveyor is a precision mechanical device that requires no internal adjustment during its expected service life when operated within rated loads and speeds.

All CAMCO Precision Link Conveyors employ the "link on link" design, meaning all links are identical to each other and can be used for fixture mounting, rather than the "link on spacer bar" design which permits only every other link to be used for fixture mounting.

The connection of the two links consists of a precision ground link pin (2) with precision needle bearings (1 and 6) in each link ear.

The ends of pins (2) are fitted with precision link pin followers (3) which ride in the main frame guides and support the loads on the face of the link as well as restricting face "in and out" movement.

Each link is furnished with link support cam followers (10) to support loads and eliminate any movement between the link and conveyor main frame.

WARNINGS AND CAUTIONS

Statements in this manual preceded by the words WARNING or CAUTION and printed in italics are very important. We recommend you take special notice of these during service or repair.

WARNING: Means there is the possibility of personal injury to yourself or others.

CAUTION: *Means there is the possibility of damage to the CAMCO unit.*

SPARE PARTS KIT

CAMCO offers a Spare Parts Kit for all CAMCO Precision Link Conveyors. These kits include link pin, needle bearings, followers, locknuts, shims and retaining rings required to rebuild (one) link assembly. These are components that will most likely require replacement during repair of your Conveyor. CAMCO recommends several Spare Parts Kits be purchased and kept on hand to insure against “down time” in the event of damage to the link components.

Individual components may be purchased in any quantity by specifying the part numbers, as noted in the Bill of Materials provided in this service manual.

BEFORE STARTING

Before starting disassembly of your CAMCO unit you should read and review the following instructions. These provide important information on parts and procedures necessary to successfully complete your repair.

Comply with all Warnings and Cautions.

Read the “Trouble Shooting Guide” section of your “General Service Manual” before disassembling CAMCO units. CAMCO recommends returning defective equipment for inspection and repair whenever possible.

CAMCO uses Loctite to secure all screws and setscrews. If you encounter a fastener that is difficult to remove, apply heat to the screw and remove while still warm.

GENERAL

Lubrication of the CAMCO's Precision Link Conveyors is largely dependent upon Work Environment, Conveyor Loading and Cycle Rate, therefore a "standard" lube interval cannot be established but instead should be determined by the Customer based on the above conditions.

The following is a recommendation for "Clean" Environment "Moderate" Loading and "30" Cycles per min.

Lubrication should be done at Take-Up end of the conveyor with the link in dwell and the motor stopped.

LINK SIZE	INTERVAL	TYPE OF LUBRICANT	LOCATION
9" LINK HEAVY DUTY	2000 HOURS	LITHIUM SOAP GREASE #1 CONSISTENCY	STANDARD LUBE FITTING AT BOTH ENDS OF LINK PIN AND LINK FACE
6" LINK TABLE TOP AND 6" LINK HEAVY DUTY	2000 HOURS	LITHIUM SOAP GREASE #1 CONSISTENCY	STANDARD LUBE FITTING AT BOTH ENDS OF LINK PIN AND LINK FACE
4 1/2" LINK TABLE TOP	2000 HOURS	LITHIUM SOAP GREASE #1 CONSISTENCY	NEEDLE LUBE FITTING AT BOTH ENDS OF LINK PIN AND LINK FACE
3" LINK TABLE TOP	LUBED FOR LIFE	———	———
2" LINK TABLE TOP	LUBED FOR LIFE	———	———
1 1/2" LINK TABLE TOP	1000 HOURS	LIGHT MACHINE OIL	OIL CAN APPLICATION BETWEEN THE LINK AND FOLLOWER AT BOTH ENDS OF LINK PIN

LUBRICATION OF SPROCKET BEARINGS

The flange bearings supporting the Sprocket/ Input Shaft should be lubricated, approx. every 2000 working hours, with NGLI #3 bearing grease.

LUBRICATION OF PRECISION LINKS

Followers equipped with lube fitting should be given a shot of Lithium Soap grease having a #1 consistency at least once every 2000 hours of operation, or 6 months, whichever is less.

In order to lubricate the link support followers (10), it may be necessary to remove any mounting fixtures or tooling which may have been added by the machine builder other than CAMCO, if provisions have not been made to access these lube fittings.

To lubricate the link pin followers (3), the conveyor drive should be placed in dwell, at which time the lube fittings can be accessed through the holes provided in the straight or radical guides. Index once and repeat the procedure until all the links have been lubricated.

NOTE: Both top and bottom guide rails (carousel), and left and right guide rails (over and under) have the lube access holes. Both should be lubricated.

NOTE: If only one access hole is provided in each side, it may be necessary to hand crank the reducer until the lube fittings appear. Repeat this procedure until all links have been lubricated.

CHAIN OR IDLER LUBRICATION

All idlers (chain or belt) are supplied with a grease fitting and should be lubricated at least once a month. Roller chains are used in some applications to drive the line shaft or provide power to optional equipment such as indexers, oscillators, pick and place units, etc. These chains should be brushed periodically with a light machine oil. Timing belts do not require any lubrication.

LINE SHAFT LUBRICATION

On conveyors supplied with a line shaft or power take-off shaft, provisions have been made in the support bearings of these shafts for periodic lubrication. These bearings are to be greased at least once every 500 hours of operation with EXXON Andok “C” or equivalent NGLI #4 bearing grease.

GENERAL MAINTENANCE LUBRICATION

The general condition of all unpainted components should be observed periodically and given a light spray of machine oil as required to retard rust.

OIL SEAL INSTALLATION RECOMMENDATIONS

We recommend that all seals be replaced anytime the device is being disassembled whether they are damaged of not, as most damage to oil seals occurs at assembly when recommended practice for seal installation is generally not followed.

1. Check dimensions to be sure that shaft and bore diameters match those specified for the seal selected.

2. Check seal for damage that may have occurred prior to installation. A sealing lip that is turned back, cut or otherwise damaged should be replaced.

3. Check bore to see that leading edge is deburred. A rounded corner or chamfer should be provided.

4. Check shaft and remove surface nicks, burrs and grooves and look for spiral machine marks that can damage the seal lip.

5. Check shaft end and remove burrs or sharp edges. Where the installation requires the shaft seal against the sealing lip, the shaft end should be chamfered.

6. Check splines and keyways for sharp edges and protect the seal lip with an assembly sleeve or shim stock. If not available, round the edges of the spline or keyway as much as possible and lubricate with a hard, fibrous grease.

7. Check seal direction making sure that the new seal faces in the same direction as the original. Generally, the lip faces the lubricant or fluid to be sealed.

8. Prelubricate the sealing element before installation by wiping with lubricant being retained.

9. Use correct installation tool — press fitting tools should have an outside diameter 0.010" smaller than the bore size. If possible, center of tool should be relieved so that pressure is applied only at the OD.

10. Use proper driving force, where possible an arbor press; otherwise, a dead blow hammer to avoid popping the spring out of the seal. NEVER HAMMER DIRECTLY ON THE SURFACE OF THE SEAL.

11. Bottom out the tool or seal to avoid cocking the seal in the bore. This also positions the seal correctly on the shaft.

12. Check for parts interference from other machine parts that might rub against the seal to cause friction and damaging heat.

CHANGING OF PRECISION LINK CAM FOLLOWERS

The changing of cam followers on CAMCO Precision Link Conveyors is done by two methods, depending upon which follower is worn.

The procedure for changing the link pin followers (3) is different from the procedure for the link support followers (10). (See Pages 12 to 15).

The following will describe the steps required for each procedure:

LINK PIN FOLLOWERS (See Pages 12 to 15)

1. Remove the radial guides from the drive end of the conveyor.

2. Index the conveyor until the worn link pin followers (3) are exposed at the end of the conveyor.

3. Remove the retaining ring (4) holding follower (3) on pin (2).

4. Remove the worn or damaged follower (3) and replace.

   CAUTION: If shims (5) are used between the link (9) and follower (3), be sure to replace before installing new follower.

5. Repeat until all worn or damaged followers are replaced.

LINK SUPPORT FOLLOWERS

1. Remove the radial guides at the take-up end of the conveyor.

2. Loosen the take-up cam locking screws (4 per side) located in slotted holes in the main frame portion of the conveyor. These are located on both sides of the fitted key section of the take-up cam.

   The slots should be obvious on both sides of the “over and under” conveyor. The slots should be obvious on the top of the “carousel” conveyor but may be more difficult to locate on the bottom due to the base mounting.

   If a pedestal mount is used, the four "forward-most” screws used to mount the base to the main frame will be the take-up cam locking screws.

   On a heavy duty base design, clearance holes will be provided to locate and access these screws. It may also be necessary, on a heavy duty base, to loosen the three end support block mounting screws, located on the bottom of the conveyor frame at the extreme end.

3. Once the locking screws have been loosened, remove the round access cover for the tension adjusting screw and back off the tensioning screws two turns. Refer to Figure 1.

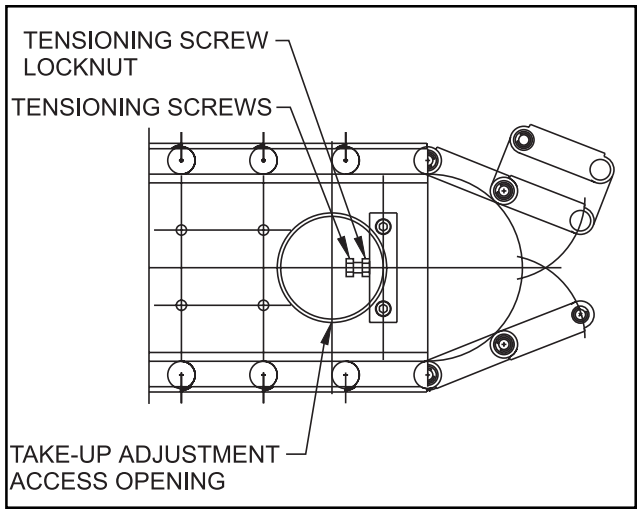


Fig. 1. Removing link.

4. At this time, it will be possible to force the take-up end towards the drive end enough to provide slack in the link chain.

5. Hand crank the index drive input reducer until the suspect link is positioned on the radial end of the take-up cam.

6. Remove retaining rings (4) on the link pins of the link to be removed.

7. Remove followers (3) and if equipped, shims (5) from one side only. If equipped with shims (5), retain for reassembly.

8. 9.0 LINK: Loosen the clamping collars (8) on the link pins of the link to be removed.

9. Pull pins (2) with remaining followers (3) through all four ears of the link connection.

10. Once the link has been removed, place the link on a work bench and remove the follower locknut (11).

11. Using a soft aluminum bar, drive out the worn follower (10).

12. Press in a new follower (10) and install a new locknut (11). (If equipped, be sure to install a new grease fitting (12) in the follower stud for future lubrication.)

13. Place link back into position so that alignment of the link ears will permit insertion of the link pin (2).

14. Insert pins (2) through all four ears of the link connection.

15. 9.0 LINK: Secure clamping collars (8) against the inside of the ears.

16. Reinstall followers (3) and, if equipped, shims (5).

17. Reinstall retaining rings (4) on the link pins.

WARNING: *Use caution when pulling chain for section removal. The chain should be held back so that a runaway condition does not occur. This can happen when the weight of the chain outside the conveyor overcomes the friction of the chain still inside the conveyor and all the links feed out uncontrollably.*

18. If other links are to be removed it will be necessary to hand crank the drive (due to the lack of chain tension) until the link to be removed is exposed at the take-up end. Repeat Steps 5 through 14 as many times as required to replace all worn followers.

WARNING: *Use caution when pulling chain for section removal. The chain should be held back so that a runaway condition does not occur. This can happen when the weight of the chain outside the conveyor overcomes the friction of the chain still inside the conveyor and all the links feed out uncontrollably.*

NOTE: When rebuilding all links, the chain can be removed in large sections by breaking the chain at the drive end as well as the take-up end. Pull a manageable length of chain out from take-up end. It is recommended that links be reassembled in same order as received from CAMCO. Number links before disassembly.

19. When all followers are changed, re-tension the chain as described in “Conveyor Tension Setting”.

GENERAL INFORMATION

To maintain and guarantee accuracy and performance of the conveyor, CAMCO utilizes a unique “chordal action compensating CAM”.

This CAM arrangement is state of the art in precision link conveyor design. Spring actuated tensioned conveyors utilizing either tail shaft or secondary tensioning were rejected by CAMCO because of the contribution to indexing inaccuracies.

Once the conveyor is properly tensioned at the factory, no further adjustment is required in the field for the duration of expected follower lift. We are including instructions for adjustments, should it become necessary to replace followers, or if the tension is lost because of extraordinary conditions (i.e., EXTREME THERMAL EXPANSION). It is recommended that CAMCO factory be consulted prior to starting with the actual adjustment. Failure to do so may void all warranties for the conveyor.

CONVEYOR RE-TENSIONING

1. Read section in general information regarding warranty.

2. Remove the radial guides at the take-up end of the conveyor.

3. Loosen the take-up cam locking screws (4 per side) located in slotted holes in the main frame portion of the conveyor. These are located on both sides of the fitted key section of the take-up cam.

   The slots should be obvious on both sides of the “over and under” conveyor. The slots should be obvious on the top of the “carousel” conveyor but may be more difficult to locate on the bottom due to the base mounting.

   If a pedestal mount is used, the four "forward-most” screws used to mount the base to the main frame will be the take-up cam locking screws.

   On a heavy duty base design, clearance holes will be provided to locate and access these screws. It may also be necessary, on a heavy duty base, to loosen the three end support block mounting screws, located on the bottom of the conveyor frame at the extreme end.

4. Once the locking screws have been loosened, remove the round access cover for the tension adjusting screw. Refer to Figure 2.

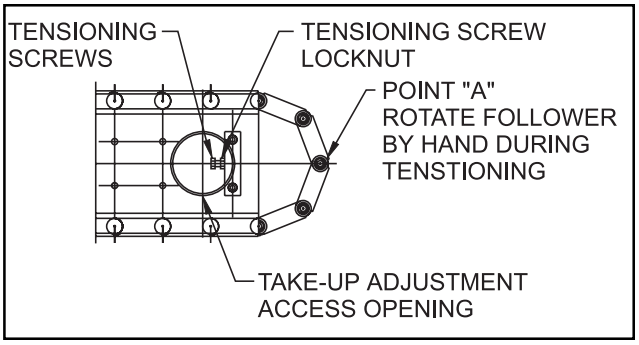

TENSIONING SCREWS
TENSIONING SCREW LOCKNUT
POINT "A" ROTATE FOLLOWER BY HAND DURING TENSTIONING
TAKE-UP ADJUSTMENT ACCESS OPENING

Fig. 2. Conveyor re-tensioning.

5. Hand crank the index drive input reducer until a link pin follower is positioned at the high point of the take-up cam (point “A” as shown in Figure 2).

6. Slowly tighten the tensioning screws, an equal amount, until it becomes impossible to turn the link pin cam follower, at point “A”, by hand. At this point, it will still be easy to turn the follower using pliers. If it is difficult with pliers, you have overtightened.

7. Be sure that the followers at both ends of the link pin have approximately. the same loading. It is important to adjust the take-up screws equally.

8. Tighten locknuts and locking screws (4 per side).

9. Re-install the radial covers and tension screw access cover.

HOW TO ORDER PARTS

Please refer to parts list shown in this manual. This parts list is for a standard Link Assy. If you feel your link is nonstandard or you are in doubt, you should contact CAMCO Customer Service at (847) 459-5200 and request a Bill of Material for your specific unit based on serial number. CAMCO maintains records on all units for a period of ten years.

You may order parts per the standard Bill of Material even if your unit is nonstandard. CAMCO's order entry people will review the closed order file based on the following information and supply you with the correct part.

REQUIRED INFORMATION

1. Original purchase order number (if available)

2. Customer name (original purchaser of conveyor)

3. Model number (located on name plate)

4. Serial number (located on name plate)

5. Approximate date of purchase.

TO ORDER PARTS contact CAMCO "Order Entry Department" Wheeling, Illinois
Phone (847) 459-5200 or FAX #847-459-3064

A. Describe the parts required and the 14 digit part number as listed in the Standard Bill of Materials or a Special Bill of Materials pertaining to your unit. State if you are using a Standard or Special bill of material.

B. Give as much of the above required information as possible.

ON WARRANTY

Replacement parts CAMCO will send freight prepaid via practical means.

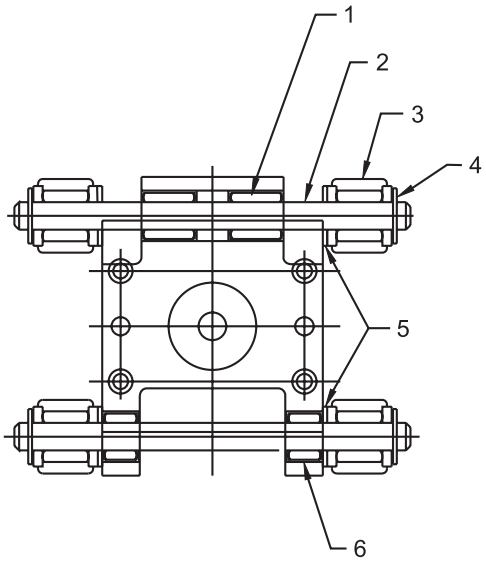
CAMCO will issue a "Returned Material Authorization Number" (RMA#) for the return of defective parts for inspection. CAMCO will bill customer for repair parts. When inspection of returned parts has been completed and determined to be a warranty problem, CAMCO will issue a credit to the customer for the repair parts and freight charges.

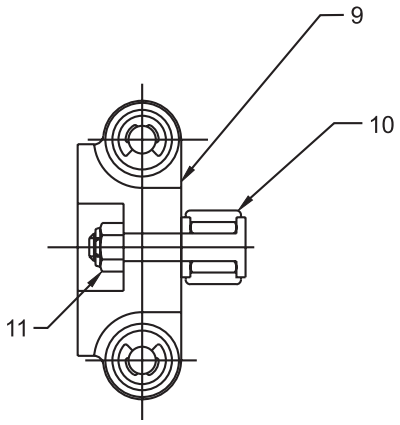
ON NON-WARRANTY

Replacement or spare parts, with approved credit, are sent F.O.B. our plant Wheeling, Illinois.

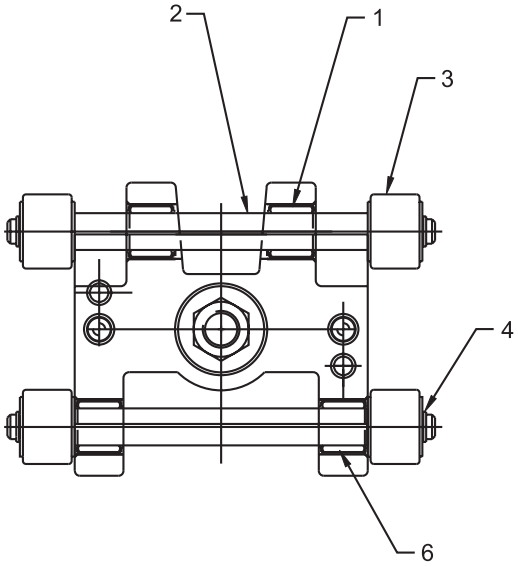
TABLE TOP

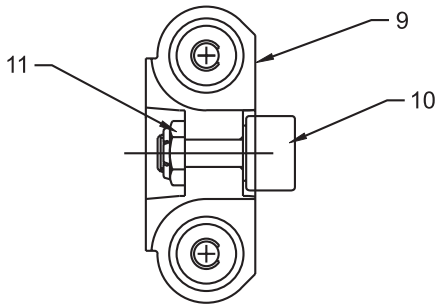
1.5 LINK ASSY



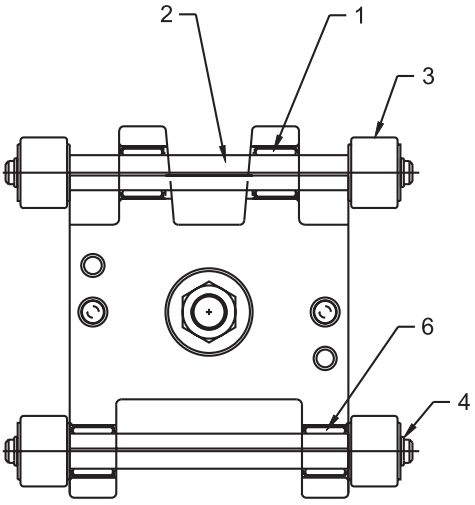


2.0 LINK ASSY





3.0 LINK ASSY



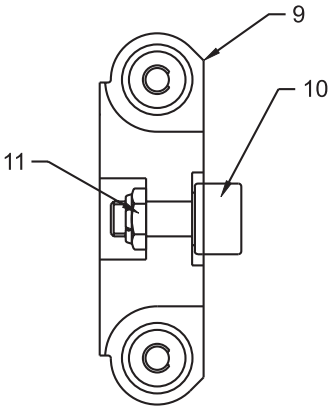


TABLE TOP

PARTS LIST FOR 1.5 LINK ASSEMBLY

ITEM NO.	PART NUMBER	DESCRIPTION
1	86A33185000000	NEEDLE BEARING
2	40A40656000000	GROUND LINK PIN
3	82B08417090002	LINK SUPPORT FOLLOWER
4	95A43089040000	RETAINING RING
5	95A39287000000	SHIM
6	86A39288000000	NEEDLE BEARING
7	NOT USED	
8	NOT USED	
9	M3B46434000000	1.5 LINK
10	82A46437000000	LINK SUPPORT FOLLOWER
11	95A26008160000	LOCKNUT
12	NOT USED	

PARTS LIST FOR 2.0 LINK ASSEMBLY

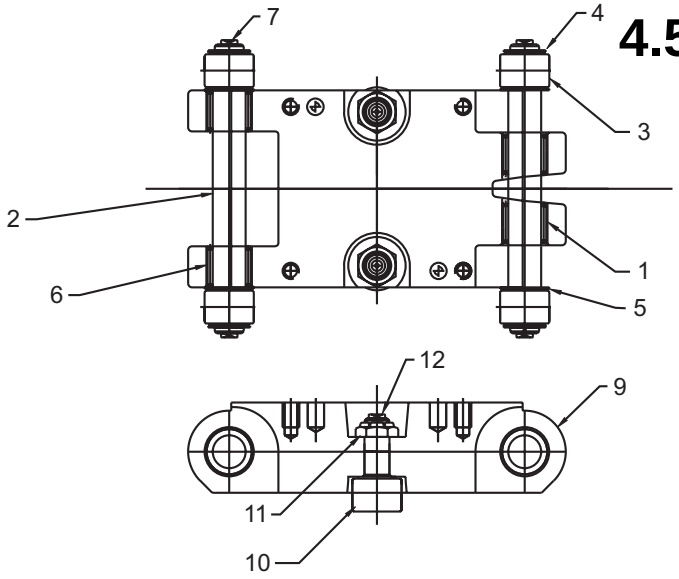
ITEM NO.	PART NUMBER	DESCRIPTION
1	86A433550000	NEEDLE BEARING
2	37B43349000000	GROUND LINK PIN
3	82A34952000000	LINK SUPPORT FOLLOWER
4	95A43089060000	RETAINING RING
5	NOT USED	
6	86A433550000	NEEDLE BEARING
7	NOT USED	
8	NOT USED	
9	M4C55877000000	2.0 LINK
10	82A43363000001	LINK SUPPORT FOLLOWER
11	95A26008130000	LOCKNUT
12	NOT USED	

PARTS LIST FOR 3.0 LINK ASSEMBLY

ITEM NO.	PART NUMBER	DESCRIPTION
1	86A433550000	NEEDLE BEARING
2	37B43349000000	GROUND LINK PIN
3	82A34952000000	LINK SUPPORT FOLLOWER
4	95A43089060000	RETAINING RING
5	NOT USED	
6	86A433550000	NEEDLE BEARING
7	NOT USED	
8	NOT USED	
9	37C55878000000	3.0 LINK
10	82A43363000001	LINK SUPPORT FOLLOWER
11	95A26008130000	LOCKNUT
12	NOT USED	

TABLE TOP

4.5 LINK ASSY



6.0 LINK ASSY

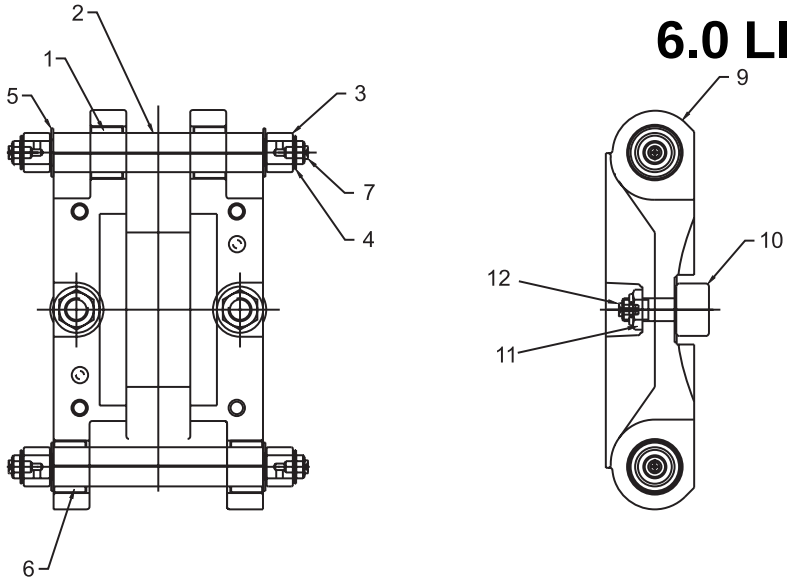


TABLE TOP

PARTS LIST FOR 4.5 LINK ASSEMBLY

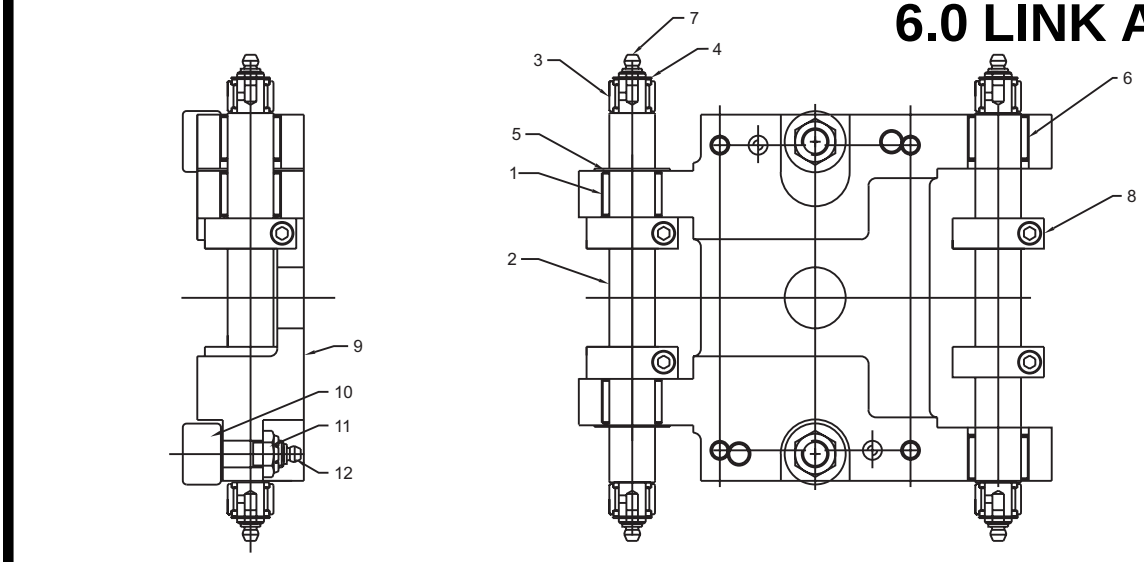
ITEM NO.	PART NUMBER	DESCRIPTION
1	86A45309000000	NEEDLE BEARING
2	M2B45289000000	GROUND LINK PIN
3	82J27323000000	LINK SUPPORT FOLLOWER
4	95A33031160000	RETAINING RING
5	95A503780000000	SHIM
6	86A45309000000	NEEDLE BEARING
7	95A45308000000	LUBE FITTING
8	NOT USED	
9	M2C55900000000	4.5 CLOSED LINK
10	82A43363000001	LINK SUPPORT FOLLOWER
11	95A26008130000	LOCKNUT
12	95A45308000000	LUBE FITTING

PARTS LIST FOR 6.0 LINK ASSEMBLY

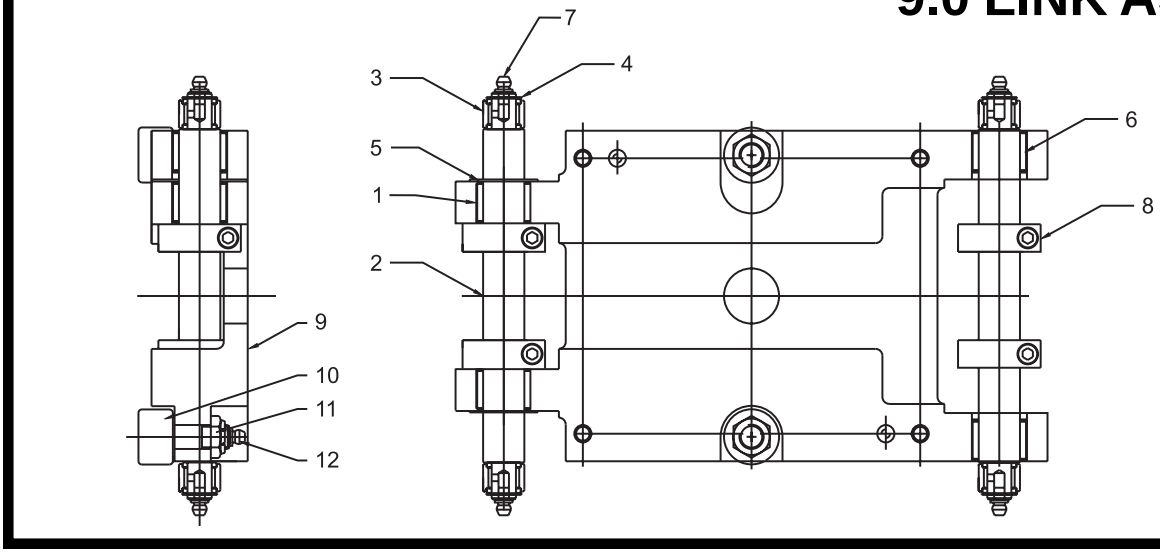
ITEM NO.	PART NUMBER	DESCRIPTION
1	86A56824000000	NEEDLE BEARING
2	M5B55985000000	GROUND LINK PIN
3	82J27323000000	LINK SUPPORT FOLLOWER
4	95A33031160000	RETAINING RING
5	86A22870030000	SHIM
6	86A56824000000	NEEDLE BEARING
7	95A45308000000	LUBE FITTING
8	NOT USED	
9	M5D55975000000	6.0 CLOSED LINK
10	82J30354000000	LINK SUPPORT FOLLOWER
11	95A26008020000	LOCKNUT
12	95A45308000000	LUBE FITTING

HEAVY DUTY

6.0 LINK ASSY



9.0 LINK ASSY



PARTS LIST FOR 6.0 LINK ASSEMBLY

ITEM NO.	PART NUMBER	DESCRIPTION
1	86J21967000000	NEEDLE BEARING
2	40K31509009999	GROUND LINK PIN
3	82J27323000000	LINK SUPPORT FOLLOWER
4	95A33031160000	RETAINING RING
5	86A29049030000	SHIM
6	86J21967000000	NEEDLE BEARING
7	95A33004020000	LUBE FITTING
8	99J26434000000	CLAMPING COLLAR
9	41C52528000000	6.0 CLOSED LINK (ALUM)
9	41C52529000000	6.0 CLOSED LINK (C.I.)
10	82J30354000000	LINK SUPPORT FOLLOWER
11	95A26008020000	LOCKNUT
12	95A33004030000	LUBE FITTING

PARTS LIST FOR 9.0 LINK ASSEMBLY

ITEM NO.	PART NUMBER	DESCRIPTION
1	86J21967000000	NEEDLE BEARING
2	40K31509009999	GROUND LINK PIN
3	82J27323000000	LINK SUPPORT FOLLOWER
4	95A33031160000	RETAINING RING
5	86A29049030000	NOT USED
6	86J21967000000	NEEDLE BEARING
7	95A33004020000	LUBE FITTING
8	99J26434000000	CLAMPING COLLAR
9	40C52670000000	9.0 CLOSED LINK (ALUM)
9	40C52673000000	9.0 CLOSED LINK (C.I.)
10	82J30354000000	LINK SUPPORT FOLLOWER
11	95A26008020000	LOCKNUT
12	95A33004030000	LUBE FITTING

NOTES

Automation

Robohand FERGUSON

CAMCO

CAMCO & FERGUSON Products
1444 South Wolf Road
Wheeling, IL 60090
USA
ph: 847-459-5200
toll-free: 800-645-5200
fax: 847-459-3064
camco@destaco.com

ISO 9001:2000 Registered

DE-STA-CO Headquarters
Auburn Hills, Michigan USA
248-836-6700
marketing@destaco.com

www.destaco.com

DE-STA-CO Europe
Germany
+49-6171-705-0
europe@destaco.com

DE-STA-CO Asia
Thailand
+66-2-326-0812
info@destaco.com

DE-STA-CO South America
Brazil
0800-124070
samerica@destaco.com

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